<u>REMARKS</u>

The Examiner has objected to the disclosure because of certain informalities. These informalities have been corrected.

Claims 1-3 and 6 have again been rejected under 35 U.S.C. Section 103(a) as being unpatentable over LeJeune in view of Presswalla and further in view of Valverde. Claims 4 and 7-11 have again been rejected under 35 U.S.C. Section 103(a) as being unpatentable over LeJeune, in view of Presswalla, Valverde, and Joannes. These grounds of rejection are respectfully traversed. Applicant has previously argued that Valverde never teaches that post-tensioned <u>tendons</u> and pre-tensioned <u>tendons</u> can be used interchangeably. The Examiner's response that "if pre-tensioned and post-tension systems can be used interchangeably, then it is obvious that pre-tensioned and post-tendon tendons can be used interchangeably as well and still perform the same function" is plainly wrong.

The Post Tensioning Institute (PTI) and Precast/Prestressed Concrete Institute (PCI) are two different national organizations that independently conduct research, confirm and promote the differences between post-tensioning systems and precast/prestressed systems.

The following excerpt is from the Post Tensioning Institute's website (<u>http://www.post-tensioning.org/info_whatispt.asp</u>). A printout from this website is also enclosed.

> There are two methods of prestressing. One is called pre-tensioning. This method consists of stressing the reinforcing inside of large steel buttresses, and then casting the concrete around the reinforcing. This method can only be done at a precast manufacturing facility and requires the completed prestressed concrete members to be trucked out to the job site and then assembled. The other method of prestressing is called post-tensioning. Instead of stressing the reinforcing inside of large steel buttresses at a manufacturing plant, the reinforcing is simply installed on the job site after the contract forms up the slabs or constructs the walls. The reinforcing steel is housed in a sheathing or duct that prevents the steel from bonding to the concrete so that it can be stressed after the concrete cures (hardens). Using the post-tensioning method of prestressing enables a builder to get all the advantages of prestressed concrete or masonry (described below) while still enabling the freedom to construct the member (slab, wall, column, etc.) on the job site.

The Precast/Prestressed Concrete Institute's (PCI) Design Handbook published by PCI also recognizes that the two systems are different. Applicant has attached pages from the PCI handbook that highlight these differences (see Section 1.3.31, third paragraph).

As seen from the above information, post-tensioned tendons and pre-tensioned tendons cannot be used interchangeably. As such, Valverde does not teach the claimed limitation of a post-tensioning tendon assembly. Because Valverde does not teach this claimed limitation, the 103(a) rejections must fail. Reconsideration and withdrawal of these rejections are respectfully requested.

Applicant has also added new claims 12 and 13 to further distinguish the claimed invention from LeJeune. Specifically, claim 12 requires the connectors to be non-cementitious. The portions of LeJeune that the Examiner has found to be "connectors" are made from concrete. See March 10, 2006 Office Action ("LeJeune discloses...a plurality of <u>concrete</u> connectors. LeJeune et al. discloses <u>concrete portions</u> extending between the first and second concrete layers, thereby interconnecting the first and second concrete layer through the insulation layer and serving as a connector"). Claim 13 requires the connectors to have a thermal efficiency greater than that of concrete. Again, because the LeJeune connectors are made from concrete, LeJeune is distinguishable from the new claim because claim 13 requires the connectors to have a greater thermal efficiency than that of concrete.

The application has been amended to correct minor informalities, to further distinguish the application over the prior art, and to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention so as to place the application, as a whole, into a <u>prima facie</u> condition for allowance. Great care has been taken to avoid the introduction of new subject matter into the application as a result of the foregoing modifications.

Accordingly, the purpose of the claimed invention is not taught nor suggested by the cited references, nor is there any suggestion or teaching which would lead one skilled in the relevant art to combine the references in a manner which would meet the purpose of the claimed invention. Because the cited references, whether considered alone, or in combination with one another, do not teach nor suggest the purpose of the claimed invention, Applicant respectfully submits that the claimed invention, as amended, patentably distinguishes over the prior art, including the art cited merely of record.

Based on the foregoing, Applicant respectfully submits that its claims 1-4 and 6-10, and 12-13, as amended, are in condition for allowance at this time, patentably distinguishing over the cited prior art. Accordingly, reconsideration of the application and passage to allowance are respectfully solicited.

The Examiner is respectfully urged to call the undersigned attorney at (515) 288-2500 to discus the claims in an effort to reach a mutual agreement with respect to claim limitations in the present application which will be effective to define the patentable subject matter if the present claims are not deemed to be adequate for this purpose.

Respectfully submitted,

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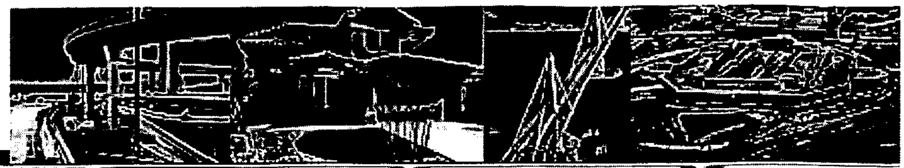
pti POST-TENSIONING INSTITUTE



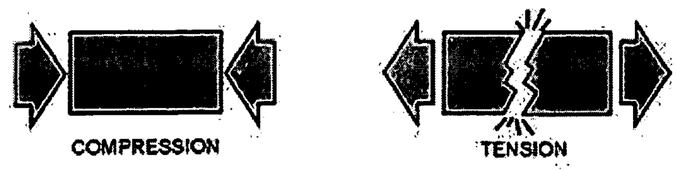
What is Post - Tensioning?

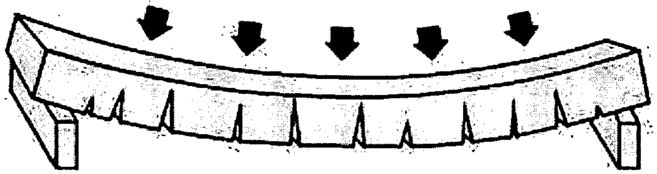
Simply put, Post-Tensioning is a method of reinforcing concrete, masonry, and other structural elements. Post-Tensioning is a method of prestressing. Prestressed concrete or masonry has internal stresses (forces) induced into it during the construction phase for the purpose of counteracting the anticipated external loads that it will encounter during its lifecycle.

There are two methods of prestressing. One is called pre-tensioning. This method consists of stressing the reinforcing inside of large steel buttresses, and then casting the concrete around the reinforcing. This method can only be done at a precast manufacturing facility and requires the completed prestressed concrete members to be trucked out to the job site and then assembled. The other method of prestressing is called post-tensioning. Instead of stressing the reinforcing inside of large steel buttresses at a manufacturing plant, the reinforcing is simply installed on the job site after the contractor forms up the slabs or constructs the walls. The reinforcing steel is housed in a sheathing or duct that prevents the steel from bonding to the concrete so that it can be stressed after the concrete cures (hardens). Using the post-tensioning method of prestressing enables a builder to get all the advantages of prestressed concrete or masonry (described below) while still enabling the freedom to construct the member (slab, wall, column, etc,) on the job site.

WHY DOES CONCRETE AND MASONRY NEED TO BE REINFORCED

Concrete, masonry, and most cement based products are very strong in compression, or, in other words, they have a high capacity to resist compressive forces. Compressive forces can be described as crushing forces. Concrete has a very high compressive strength. It can be anywhere from 2,500 pounds per square inch, in most residential foundations, to 4,000 psi in suspended slabs and walls in buildings, to even higher strengths in bridges. However, concrete is relatively weak in tension, i.e. it doesn't resist tensile forces very well. Tensile forces are the forces that pull an element apart.





Tensile forces pull apart the bottom of this concrete slab when it bends

Conversely, steel is very strong in tension. It has a high capacity for resisting the forces that pull apart or bend it. Therefore, combining reinforcing steel with concrete or masonry results in a product that can resist both compressive forces and tensile forces. Additional, substantial benefits can be obtained by using the reinforcing steel to "squeeze the concrete together", or place it in compression. Compressing the concrete increases it tensile (bending) strength. By increasing the tensile strength of the concrete itself (making the concrete slab or masonry wall stiffer), a designer can achieve longer spans with thinner concrete sections.

Putting the concrete into compression also helps to resist the development of shrinkage cracks. Shrinkage cracks, while typically not detrimental to the performance of the structure, can be unsightly, and can allow the passage of moisture or termites. Shrinkage cracks will develop in most cement based products as the water combines with the cement and the concrete cures (hardens). The more the concrete is "squeezed together", the less likely it is that shrinkage cracks will develop or open.

WHAT KIND OF MATERIALS ARE USED IN POST-TENSIONING

Post-Tensioned reinforcing consists of very high strength steel strands or bars. Typically, strands are used in horizontal applications like foundations, slabs, beams, and bridges; and bars are used in vertical applications like walls and columns. A typical steel strand used for post-tensioning has a tensile strength of 270,000 pounds per square inch. In comparison, a typical non-prestressed piece of reinforcing (rebar) has a tensile strength of 60,000 psi . Strands typically have a diameter of ½ in., and are stressed to a force of 33,000 pounds using a hydraulic jack.

The prestressing steel is housed in a sheathing or duct to allow it move as the tensioning force is applied after the concrete cures. The steel stretches as it is tensioned, and it is locked into place using an anchoring component that forms a mechanical connection and keeps the force in the strand for the life of the structure.

USES AND ADVANTAGES

Post-Tensioned reinforcing has been used for many decades in bridges, elevated slabs (parking garages and residential or commercial buildings), residential foundations, walls, and columns. The use of post-tensioned reinforcing can result in thinner concrete sections, longer spans between supports, stiffer walls to resist lateral loads, and stiffer foundations to resist the effects of shrinking and swelling soils. The additional advantage of putting the concrete into compression can be used to construct slabs and walls that have fewer visible cracks that can allow the passage of moisture and termites.

HOW DO I GET MORE INFORMATION

More information can be obtained by contacting a post-tension material supplier located in your area. Always make sure to utilize a material supplier who has a PTI Certified Plant.

8601 North Black Canyon Highway
Suite 103, Phoenix, AZ 85021 U.S.A
Phone: (602) 870-7540 Fax: (602) 870-7541
info@post-tensioning.org

is also a tendency for the solids to settle, leaving a layer of water on the top. Special ingredients or treatments can improve these characteristics.

For very small spaces in confined areas, grout may be pumped or pressure injected. The confinement must be of sufficient strength to resist the pressure. Less water may be used than for flowable grouts, hence less shrinkage and higher strength.

A stiffer grout, or mortar, is used when the joint is not totally confined, for example in vertical joints between wall panels. This material will usually develop strengths of 3000 to 6000 psi, and have much less shrinkage than flowable grouts.

Drypack is the common name used for very stiff sand-cement mixes. They are used if a relatively high strength is desired, for example, under column base plates. Compaction is attained by hand tamping.

When freeze-thaw durability is a factor, the grout should be air-entrained. Air content of plastic grout or mortar of 9% to 10% is required for adequate protection.

Typical portland cement mortars have very slow early strength gain when placed in cold weather. Heating the material is usually not effective, because the heat is rapidly dissipated to surrounding concrete. Thus, unless a heated enclosure can be provided, special proprietary mixes, usually containing gypsum, may be indicated. Mixes containing a high percentage of gypsum are known to deteriorate under prolonged exposure to water.

1.3.2.2 Non-Shrink Grouts

Shrinkage can be reduced, or more appropriately, compensated for by the use of commercially available non-shrink, high-strength pre-mixed grouts. These mixes expand during the initial hardening to offset the subsequent shrinkage of the grout. Since the non-shrink grouts are primarily proprietary, their chemical composition is usually not available to study their potential effects on the interfacing materials, such as reinforcement and inserts in the connection. Thus, it is advisable that manufacturers' recommendations should be carefully followed. For a general reference on the characteristics and methods of testing of non-shrink grouts, see Ref. 19.

1.3.2.3 Epoxy Grouts

Epoxy grouts are mixtures of epoxy resins and a filler material, usually oven dried sand. These are used when high strength is desired, or when improved bonding to concrete is necessary. Ref. 20 is a comprehensive report on the subject by Committee 503 of the American Concrete Institute.

The physical properties of epoxy compounds vary widely. Also, the epoxy grouts behave very differently than the sand-cement grouts. For example, the thermal expansion of an epoxy grout can be as much as seven times the thermal expansion of sand-cement grout. Epoxy grouts may not be applicable where fire rating is required. It is, therefore, important that use of these grouts be based on experience and/or appropriate tests. Recommended tests and methods are given in Ref. 20. See Chapter 9 for additional information.

1.3.3 Reinforcement

Reinforcement used in structural and architectural precast concrete includes prestressing tendons, deformed steel bars, and welded wire reinforcement.

Fibers, which are sometimes used to control shrinkage cracks, do not have well defined structural properties and, therefore, cannot be used to replace structural reinforcement such as welded wire reinforcement. This is particularly important for structural toppings over precast concrete decks. The reinforcement in these toppings cannot be replaced with fibers.

1.3.3.1 Prestressing Tendons

Tendons for prestressing concrete may be wires, strands or high strength bars. In precast and prestressed structural concrete, nearly all tendons are 7-wire strands conforming to ASTM A416. There is limited use of 2-wire and 3-wire strands conforming to ASTM A910. The strands are pretensioned, that is, they are tensioned prior to placement of the concrete. After the concrete has reached a predetermined strength, the strands are cut and the prestress force is transferred to the concrete through bond.

Two types of strand are covered in ASTM A416 and A910: "low-relaxation" strand and "stress-relieved" strand. Low-relaxation strand is the standard in North America and is used in the load tables in Chapter 2 and in the various examples throughout this Handbook.

Sometimes, architectural precast concrete contains tendons. Depending on the facilities available at the plant, these tendons may be either pretensioned or post-tensioned. In post-tensioning, the tendons are either placed in a conduit or are coated so they will not bond to the concrete. The tendons are then tensioned after the concrete has reached the predetermined strength. The compressive forces are transferred to the concrete from the strand by end fittings on the strand, which bear directly against the end surfaces of the concrete member. When the

dons are placed in a conduit, they are usually uted after tensioning (bonded post-tensioning). en they are greased and wrapped, or coated, y usually are not grouted (unbonded post-sioning). For more information on post-tensioning general, see Ref. 21.

Precast products are typically prestressed with re strand. Prestressing bars meeting ASTM 22 have been used in connections between mbers, and may be applicable for prestressing rt members where the seating losses associated strand anchors are not acceptable. The perties of prestressing strand, wire and bars are en in Chapter 11.

The ability of strands to properly bond should certified by the strand supplier.

3.2 Deformed Reinforcing Bars

Reinforcing bars are hot-rolled from steel with ing carbon content. They are usually required to et ASTM A615, A616 or A617. These specifica-s are of the performance type, and do not closely rol the chemistry or manufacture of the bars. s are usually specified to have a minimum yield 40,000 psi (Grade 40) or 60,000 psi (Grade 60). de 40 bars will usually have lower carbon tent than Grade 60. It is sometimes possible to d these grades of reinforcing bars after ropriate preheating depending on carbon ivalency. [27]

ASTM A706 specifies a bar with controlled emistry that is weldable. See Chapter 6 for further cussion of welding.

In order for the reinforcing bar to develop its full ngth in the concrete, a minimum length of bedment is required or the bars may be hooked. rmation on bar sizes, bend and hook dimensions d development length is given in Chapter 11 and f. 22.

3.3 Structural Welded Wire Reinforcement

Structural welded wire reinforcement is a fabricated reinforcement consisting of parallel, d-drawn wires welded together in square or tangular grids. Each wire intersection is ctrically resistance-welded by a continuous omatic welder. Pressure and heat fuse the rsecting wires into a homogeneous section and all wires in their proper position.

Plain wires (ASTM A185), deformed wires STM A497) or a combination of both may be used welded wire reinforcement. Plain wire sizes are ecified by the letter W followed by a number dicating the cross-sectional area of the wire in ndredths of a square inch. For example, W16 denotes a plain wire with a cross-sectional area of 0.16 sq in. Similarly, deformed wire sizes are specified by the letter D followed by a number which indicates area in hundredths of a square inch.

Plain welded wire reinforcement bonds to concrete by the mechanical anchorage at each welded wire intersection. Deformed welded wire reinforcement utilizes wire deformations plus welded intersections for bond and anchorage. Welded wire reinforcement for architectural precast concrete is normally supplied in flat sheets. Use of welded wire reinforcement from rolls, particularly in the thin precast sections, is not recommended because the rolled welded wire reinforcement cannot be easily and reliably flattened to the required placement tolerance. In addition to using welded wire reinforcement in flat sheets, many plants have equipment for bending sheets into various shapes, such as U-shaped stirrups, four-sided cages, etc.

Available wire sizes, common stock sizes and other information on welded wire reinforcement are given in Chapter 11 and Ref. 23.

1.3.4 Durability

Concrete durability is a concern when the structure is exposed to an aggressive environment. The designer, contractor, and owner must recognize the deleterious effects of (a) freezing and thawing cycles in a cold, wet environment, (b) chemical attack, including carbonation, (c) corrosion of embedded metals, and (d) aggregate reactivity. The ideal approach is to make the concrete impermeable, which means making the concrete as uniformly dense as possible and designing to control cracking. In this respect, precast and prestressed concrete has inherent advantages because it is produced in a controlled environment that lends itself to high quality concrete, and prestressing leads to effective crack control.

Durability is enhanced by proper mix design with low water-cementitious materials ratio, adequate cover over reinforcement, chloride exclusion, non-reactive aggregates, air entrainment, proper finishing, proper curing, and in parking structures and bridge decks, design for adequate drainage. Other measures that may incrementally improve durability include coating of non-prestressed reinforcement, low-alkali cement, surface sealers and surface membranes.

Penetrating surface sealers can improve the durability of concrete by reducing moisture and chloride penetration. Sealers have, however, little ability to bridge cracks and should not be expected to provide protection from moisture absorption or chloride penetration at cracks. Some sealers have proven to be more effective than others. Their